

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 31 December 2008 has been entered.

Election/Restrictions

2. Claims 3, 19, 27 and 42 (renumbered 1, 6, 14 and 16, respectively) are allowable. Claims 5, 7 and 44 (renumbered 3, 5 and 18, respectively), previously withdrawn from consideration as a result of a restriction requirement, require all the limitations of an allowable claim. Pursuant to the procedures set forth in MPEP § 821.04(a), **the restriction requirement among inventions I and II, as set forth in the Office action mailed on 31 December 2007, is hereby withdrawn** and claims 5, 7 and 44 (renumbered 3, 5 and 18, respectively) are hereby rejoined and fully examined for patentability under 37 CFR 1.104. In view of the withdrawal of the restriction requirement, applicant(s) are advised that if any claim presented in a continuation or divisional application is anticipated by, or includes all the limitations of, a claim that is allowable in the present application, such claim may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once the restriction requirement is withdrawn, the provisions of 35 U.S.C.

121 are no longer applicable. See *In re Ziegler*, 443 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

EXAMINER'S AMENDMENT

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Jennifer M. McCue (Reg. No. 55,440) on 14 January 2009.

The application has been amended as follows:

19. (Currently amended) A pixel circuit for use in an imaging device, said pixel circuit comprising:

a plurality of photosensors for generating charge during an integration period;
a plurality of shutter transistors, each shutter transistor connected to and transferring charge from a respective photosensor;

a plurality of storage nodes, wherein each storage node comprises a capacitor which is coupled to a respective shutter transistor via a shutter line and wherein each node stores charge transferred by a respective one of said plurality of photosensors;

a plurality of transfer transistors, each transfer transistor connected to and transferring charge from a respective storage node;

a floating diffusion node connected to said plurality of transfer transistors for receiving charge from said transfer transistors; and

a readout circuit connected to said floating diffusion node to output charge accumulated at the floating diffusion node;

wherein said capacitor of each storage node is coupled to a gate portion of said respective shutter transistor.

27. (Currently amended) A pixel circuit for use in an imaging device, said pixel circuit comprising:

a photosensor for generating charge during an integration period;

a shutter transistor connected to said photosensor to transfer charge from said photosensor;

a storage node connected to said shutter transistor;

a storage capacitor connected between a gate of said shutter transistor and said storage node, the storage capacitor receiving said charge transferred by said shutter transistor;

a transfer transistor connected to said storage node to transfer charge from said storage node;

a floating diffusion node connected to said transfer transistor to receive said charge from said transfer transistor;

a reset transistor connected to said floating diffusion node for resetting the voltage on the floating diffusion node;

a source-follower transistor connected to said reset transistor for receiving charge from the floating diffusion node; and

a row select transistor connected to said source-follower transistor for outputting a signal produced by said source follower transistor,

wherein a plurality of said photosensors, shutter transistors, storage capacitors and transfer transistors share said floating diffusion node, reset transistor, source follower transistor, and row select transistor.

28. (Canceled)

49. (Canceled)

Allowable Subject Matter

4. Claims 3-7, 19-27, 29 and 42-48 (renumbered 1-22) are allowed.
5. The following is an examiner's statement of reasons for allowance:

Independent claims 3, 19, 27 and 42 (renumbered 1, 6, 14 and 16, respectively) are directed to an image sensor and a method of operating an image sensor wherein plural photosensors (e.g. 401, 402), shutter transistors (e.g. 404, 416), storage nodes (e.g. 410, 426), storage capacitors (e.g. 408, 420), and transfer transistors (e.g. 414, 428) share at least a floating diffusion node (e.g. 430). Please refer to Figure 3 of Applicant's Specification. Further, these claims require the storage capacitor is connected/coupled/tied to the gate of the shutter transistor. The examiner could not find

prior art with this claimed configuration. The Examiner's search yielded the following related art:

1. **US Patent No. 6,317,154 and US Patent No. 6,243,134 (both issued to Beiley)** disclose a pixel structure in Figure 5 that is similar to Applicant's claimed invention. Figure 5 of the '154 and '134 patents disclose a photosensor (e.g. PD2), a shutter transistor (e.g. M11), a storage node (e.g. D), a storage capacitor (e.g. C2) and a transfer transistor (e.g. M12) coupled to a floating diffusion node (e.g. E). However, the '154 and '134 patents do not disclose sharing a floating diffusion node as required by Applicant's claimed invention (see Figure 3). Also, the '154 and '134 patents do not disclose that the storage capacitor is connected/coupled/tied to the gate of the shutter transistor as required by Applicant's claimed invention (see Figure 3).
2. **US Patent No. 7,045,754 (issued to Manabe et al.)** discloses a shared floating diffusion pixel similar to Applicant's claimed invention, however *does not* qualify as prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RICHARD M. BEMBEN whose telephone number is (571)272-7634. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Ometz can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David L. Ometz/
Supervisory Patent Examiner, Art
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